OTS: 60-31,483

JPRS: 3631

30 July 1960

SCIENCE, TECHNOLOGICAL PROGRESS, AND LABOR IN THE USSR

- USSR -

by V. Nemchenko

Distributed by:

OFFICE OF TECHNICAL SERVICES
U. S. DEPARTMENT OF COMMERCE
WASHINGTON 25, D. C.

U. S. JOINT PUBLICATIONS RESEARCH SERVICE
205 EAST 42nd STREET, SUITE 300
NEW YORK 17, N. Y.

F O R E W A R D

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JPRS: 3631
CSO: 3706-D

SCIENCE, TECHNOLOGICAL PROGRESS, AND LABOR IN THE USSR

[Following is a translation of an article by V. Nemchenko in the Russian periodical V pomoshch' politicheskomu samoobrazovaniyu (Aid to Political Self-education), Vol. 3, No. 4, April 1959, Moscow, pages 75-86.]

The Twenty-First Congress of the Communist Party of the Soviet Union adopted a plan for the development of the nationaleeconomy in 1959-1965 which constitutes the most important portion of the program for creating the material-technological base of Communism. The rapid development of the productive forces based on the further growth of technology throughout all branches of the national economy and the increased productivity of socialist labor will permit reaching a level of material-goods production which willmmake it possible to ensure a standard of living for the people that will be immeasurably higher than under capitalism.

The building of a Communist society has become the daily concern of the millions of toilers in our country who are deeply convinced of the practicability of the truly grandiose plans for the future which were outlined by the Twenty-First Party Congress. Thus the ever-growing interest in the theoretical problems of Communismis understandable.

In this article we shall attempt to examine certain problems connected with the role of science and technology in the creation of the material-technological base of Communism, and also the problems of changes in the character of labor in the process of creating this material-technological base.

Every year industry and technology present science with more and more varied and serious problems whose solutions are not only a mighty stimulus to the growth of science itself but are also of enormous importance to production. The experience of recent decades provides evidence that the progress of technology is unthinkable without extensive development of scientific research and without the constantly expanding application of the results of this research in improving industrial production.

The principal trends in technological progress are linked with the improvement of machine production, its power base, and with the development and use of new materials in production.

In our times the chief line for improving machine production is automation, which presupposes the extensive development of scientific research in the sphere of the entire complex of natural and technological sciences, with priority assigned to radio electronics.

The process of the automatization of production is proceeding along with and following the complex mechanization of labor. It is necessary to bear in mind, however, that the mechanization of labor does not proceed in the same manner under the conditions prevailing under capitalism and under socialism. Under capitalism it proceeds unevenly --periods of rapid growth are frequently replaced by periods of stagnation and even returns to manual labor. Moreover, it does not include different branches of production in thesame way.

In the USSR, where mechanization of branches of production, which was established as one of the most important problems of the national economy and was carried out by plan for the first time in the history of mankind, the process of introducing machinery proceeded at a particularly rapid pace. The problem formulated by V. I. Lenin at the Eighth All-Russian Congress of Soviets--"It is essential to introduce more machinery everywhere, to turn to the application of machine technology as widely as possible" (Collected Works, Vol 31, page 478)--was subsequently given concrete form in the plans for the development of the national economy. In particular, it was emphasized even in the prewar five-year plans that first priority should be given to the mechanization of tedious and heavy labor. The problem of complex mechanization was also formulated before the war.

During the Soviet regime enormous progress has been achieved in the field of the mechanization of production, which is one of the necessary conditions for increasing the productivity of labor. In a number of branches of production, however, the economic effect of mechanization is still inadequate because not all operations of the technological processes have been mechanized. Wedging manual operations between mechanized ones materially lowers the effect of using machinery, not only because this limits their productivity but also because partial mechanization sometimes requires increasing manual labor on operations accompanying the mechanized operations. Thus, for example, the power available per worker in the timber industry in 1955 was almost seven times the prewar level, and the level of mechanization of the basic operations had increased by ten times. But the productivity of labor had risen only 6 percent during this time. This is explained first of all by the fact that mechanization in the timber industry has not yet included all links of the production process. A similar situation existed in coal mines. In spite of the fact that after the war they received a large pool of high-production machines which permitted practically complete mechanization of a number of basic operations such as cutting, breaking loading, hauling, and others, the productivity of labor in the mines grew only 8.7 percent during this period. The principal cause for this is again the fact that the share of manual labor is still great in the mines, which does not permit the full use of machinery. It can be noted in this connection that the growth of mechanization in the coal mining industry resulted in increasing the relative proportion of groups of workers engaged in accomplishing adjoining operations by hand (from 17.8 percent in 1946 to 22.6 percent in 1954), along with a decrease in the number of workers engaged in manual labor. The problem of complex mechanization is also an acute issue in machine manufacture, where about one half the workers are engaged in manual labor.

By eliminating manual labor from the technological chain complex mechanization will also liquidate the worst bottlenecks retarding the growth of labor productivity. The further implementation of the complex mechanization of production processes outlined by the Seven-Year Plan should eliminate heavy manual labor from all branches of the national economy; along with replacing obsolete equipment with new and more productive equipment, it will result in a marked increase in labor productivity.

According to the calculations of some economists, complex mechanization of the coal and timber industries, for example, will permit reducing the expenditure of labor per unit of production by at least one half. Mechanization of loading and unloading work can give the same effect in all branches of the national economy.

Complex mechanization makes complex automation possible, and complex automation ultimately means removing the worker from the direct control of machinery and production processes. The modern high-speed computers being applied in production control the technological processes, thus ensuring the automatic progress of a process in accordance with a given routine. Progress in radio electronics and cybernetics are already permitting the transition to developing computers which will determine the most effective routine for a process and ensure that it is carried out. Man's role will then be reduced to watching the operation of the devices, adjusting the devices and automatic machinery, and devising programs for the controlling machines.

In many cases, complex mechanization and automation require changes in technology which will take into account the physical and chemical properties of the object of the work in the most effective manner. Thus, the hydraulic breaking of coal is being introduced into the coal mining industry before our very eyes--a process which will make more rational use of the mechanical properties of coal in removing it from the seam. (As a brittle solid, coal is most easily broken up by impact; such an impact load is brought about by streams of water from a hydraulic monitor under great pressure.) Moreover, the hydraulic breaking of coal simplifies coal mining, making it a continuous process. In many branches of production, automation requires that mechanical methods of processing be replaced by chemical and physical-chemical methods.

The Seven-Year Plan outlines an extensive program of measures for automatizing production. The establishment of more than 50 pilot enterprises in which the very newest schemes of complex automation will be applied will be of vital importance. The exploitation of these enterprises will permit the accumulation of experience which will serve as a basis for the rapid development of complex automation in succeeding years. Practice indicates that the introduction of automation can increase labor productivity by at least 5 to 10 times.

The modern pool of machine tools and machines would be unthinkable without a mighty power base. Electric power, which is the most universal form of energy, puts millions of machine tools and machines into operation in all branches of the national economy. It is understandable, therefore, that further technological progress can be supported only by a well coordinated power system which should be capable of satisfying rapidly growing requirements for electric power. It was this that caused V. I. Lenin to advance his wise idea of supplying the nation with electric power.

The Seven-Year Plan for Development of the National Economy calls for increasing electric power production by 2.1-2.2 times in 1965. Our country has at its disposal varied power resources in sufficient amounts and can increase the size of its power economy as required. The unified

power systems in the European part of the USSR and Central Siberia, as well as the associated power systems in regions of the Northwest and the West, the Transcaucasus, Kazakhstan, and Central Asia, established by the Seven-Year Plan, mark a great new stride forward on the path toward the most economical and effective use of all types of power resources. The portion of electric power produced by atomic electric-power stations is being increased. As is well known, the first station of this type was built in 1954 in the Soviet Union. The extensive construction of atomic electric-power stations which has been started will increase power resources materially.

Science is faced with the problem of discovering ways for achieving the direct transformation of the energy in fuels (including atomic energy) into electrical energy. Successful solution of this problem will mean an increase in the coefficient of efficiency of electric power stations by several times, which is equivalent to an increase in power resources.

In the more remote future, research on the control of thermonuclear reactions, which was started for the first time in the USSR in 1950 promises to give mankind a practically inexhaustible source of power.

The development and use of new synthetic materials which will gradually penetrate into all branches of production, particularly machine manufacture, and displace the traditional materials, in the first instance metals, is less important to further technological progress. Their properties not only are equal to these traditional materials, but even excel them. Thus, for example, the needs of the aviation, automotive, and shipbuilding industries in respect to light and strong materials can be satisfied by synthetics. Plastics are being used to make screw propellers for ships, rocket parts, et cetera. The Seven-Year Plan calls for increasing the production of plastics by more than 7 times and that of synthetic fibers by 12-13 times. According to the plan, the use of synthetics in machine manufacture is to be increased by 5 times.

The application of synthetic materials means not only an improvement in the operational quality of the products, which is of course the most important factor, but also a sharp decrease in the amount of labor required to manufacture them, due to the extraordinary simplification of the technology of processing synthetics (pressing, casting, and stamping of products without subsequent mechanical processing).

It is difficult now to give any summary evaluation of the possibilities for increasing labor productivity which have been opened by the use of synthetic materials. N. S. Khrushchev gave an interesting example in his speech before the workers of the Stalinogorsk Chemical Combine--just the use of high-strength cord made of synthetic fibers combined with new types of synthetic rubber will permit increasing the service life of automotive tires by 30-40 percent and will save the country 2-2.5 billions of rubles every year.

Modern science has already begun to solve the problem of discovering materials with previously specified properties, which opens still more enticing prospects.

Technological progress in all three of these basic fields is connected not only with an enormous growth in science itself, but also with great changes in the social role of science. The latter depends ultimately on the conditions of the application of science in production and the social results of such application.

The work of the Twenty-First Congress of the Communist Party of the Soviet Union and the resolutions it has adopted show the magnitude of the role assigned to science and technology in our advance toward Communism. Solution of the problem of catching up with the labor productivity of the United States of America, as the most highly developed capitalist nation, is one of the points of departure on this path.

Since science and technology are being developed quite rapidly in the United States, too, the question may arise as to what is the basis for the assurance that the tempo of technological progress will be faster in our country than in the United States.

This assurance is based first of all on considerations of the advantages derived from socialist production attitudes toward the development of science and technology. V. I. Lenin said of these advantages: "...only socialism will free science from its bourgeois path, from its enslavement to capital, from its serfdom before the interests of dirty capitalist self-interest. Only socialism will make it possible widely to extend and actually subordinate social production and the distribution of products according to scientific considerations for making the life of all working people lighter and making prosperity available to them" (Collected Works, Vol. 27, page 375).

Socialism and Communism mark a new era in the development of society, because here, for the first time, the people are acting in accordance with the laws of social development which they discovered, their knowledge of which is continually being deepened and extended in the very process of their social activities. The latter are directed by the socialist state and the Communist Party which see as their prime task drumming into the consciousness of every worker the scientifically founded plans of Communist construction, the concrete objectives that stand before society. It is this which makes possible the best use of the objective possibilities created by socialist production relationships, and an acceleration of the tempo of development that is impossible under capitalist relationships. Apologists for capitalism cannot avoid the fact that the average annual increase in labor productivity in industry is approximately 6-7 percent in the Soviet Union and 1.5-2 percent in the United States. If such tempos are maintained, and they will undoubtedly be maintained, out country will surpass the United States in labor productivity in the next decade.

It is necessary to take into account the great differences which exist in the organization of scientific research under capitalism and under socialism. As Marx pointed out, the scientific development of technological processes was made possible for the first time by the capitalist machine industry. Up to the end of the nineteenth century this task was carried out by scientists and inventors who generally worked alone, and as a result the application of science to production had a sporadic character. The development of monopolistic capital led to the generalization of technological creativeness which was expressed in the establishing of scientific research establishments to serve monopoly.

These establishments turned to research and the improvement of production within the bounds of their individual types, most often within the bounds of individual enterprises. The process of the generalization of scientific and technological creativity subordinated almost all science in capitalist nations, especially in the United States, to the interests of monopolies, which gave rise in particular to such a monstrous phenomenon as the militarization of science.

The picture under the conditions of socialist society is fundamentally different. The socialistic structure has opened new prospects for the utilization of science in production on the scale of the entire national economy. The organizational structure of scientific research institutions in the USSR is being adapted unswervingly toward fulfillment of this task in its full magnitude.

The special feature of the organization of scientific research work in the USSR is that it makes possible the planned direction of the efforts of large numbers of scientific personnel toward the solution of the central problems of science and technology, thus opening new perspectives before production. In the United States, the concentration of scientific research is possible only so far as it conforms to the interests of monopolistic groups. The possibility of concentrating scientific resources on the study of any problem means the greater probability of its successful solution, as modern science knows almost nothing of accidental discoveries.

Soviet science has realized its advantage in many achievements, which have won it first place in the world in a number of fields. The first atomic electric-power station was built in the USSR; out country has first place in astronautics and in the study of cosmic space. I dare say, however, that Soviet science has demonstrated its advantage most clearly in the colossal scale of the detailed study of the rich resources of the nation and the complex development of daring plans for their over-all utilization.

It is obvious that scientific and technological achievements do not, of themselves, determine the development of production. They create the possibility, the prerequisites for technological progress, but the realization of these possibilities, the scale, and the tempo of technological progress is determined by social and economic conditions.

Knowledge of the new laws and phenomena of nature, of new properties of substances, et cetera, which open possibilities for their use, could for example, facilitate an increase in the discovery of reserves of useful minerals in geological prospecting. Deposits of useful minerals are of no use whatever prior to their discovery and prospecting, or even until their development is started. Thus, scientific discoveries and the inventions based on them acquire practical value only when people begin to make use of them in the national economy. At the same time, the results obtained from their use depend materially upon who does this. Large enterprises probably organize the developments of deposits more rationally and cheaply than small enterprises, and it may happen that small enterprises simply will not organize their exploitation. This is also true of individual discoveries or inventions.

We used this simplified example to show vividly the cause of the advantage of the socialist structure over the capitalist structure in the use of scientific and technological achievements. In contrast to the capitalist society, the socialist society does not place any limits on their application that are connected with private ownership of the means of production, while the planned management of the economy on a national scale permits the most effective use of scientific and technological achievements.

Under the conditions of capitalist production relationships, the automatization of industry will lead to increasing unemployment, to increasing social contradictions, and to overproduction crises. The possibilities opened by science and technology are utilized only to an insignificant degree. In socialist countries, on the other hand, automation will lead to lightening toil and improving its conditions. Increased labor productivity brought about by automation means, in this case, the possibility of shortening the working day, which will make possible the further growth of the cultural level of the workers and their material well-being. It is precisely for this reason that the task has been established in the USSR of systematic development of automation on a wide front, the task of the most complete use of the possibilities opened by science and technology.

The extensive introduction of automation in the socialist countries will mean great changes in the character of work: automation will decrease the share of monotonous and fatiguing operations and will notably increase the share of creative work. The elevation of the cultural and technical level of the Soviet workers is demonstrated by the fact that even now the process of eradicating the boundaries between mental and physical work is going on in practice. The number of inventors and innovators among the workers is growing constantly. The time is approaching when, according to the words of K. Marx, work will become "experimental science, materially creative and object-embodied science" (from unpublished manuscripts, Bol'shevik, Nos. 11-12, 1939, page 65).

The transformation of the basic mass of workers from simple executors to creators means a jump in the development of society, since it signifies not only an expansion of the scale for the application of science and production but also an extraordinary fertilization of science by practice. Such a jump could never be accomplished under the capitalist system. In the USSR, as in the other countries of the socialist camp, the practical work of millions of the working masses headed by Marxist-Leninist parties is directed unswervingly toward the solution of this problem, which provides the most important guarantee of our victory in the competition with capitalism in the sphere of technological progress, and in the establishment of the material-technical base of Communism.

In spite of the fact that there are no impassable boundaries between the two phases of Communist society, the second phase is distinguished from the first, in particular, by a more varied and a deeper application of scientific knowledge to production. This relates to an equal degree to both natural science knowledge applied to technology and to industry and to data from the social sciences, in the first instance economics. This knowledge, these data, serve as bases for compiling our national economic plans and determining the proportion of different branches of production and socialized labor.

If we compare with the preceding ones, in particular with the first national economic plans, the national economic plan for the next 7 years which was adopted by the Twenty-First Congress, it is not difficult to see that the Seven-Year Plan has been developed in a more detailed and comprehensive manner and that its tasks are more concrete and better founded scientifically than the tasks of the previous plans. This indicates that the socialist state has become more effective than it was previously in taking into account the requirements of the economic laws of socialism and the possibilities of science and technology in the development of productive forces.

This demonstrates that the masses of the population have grown immeasurably in spiritual and scientific-technological respects. They simply could not understand and put into practice the state plans if they did not also take active part in their development. The scientific and technical experience and the economic knowledge of the tens of thousands of Soviet specialists who had taken their places in the preceding years was taken into account in the process of compiling the tasks of the Seven-Year Plan and its extensive discussion.

Science grows more extensive and deeper with every year. It grows more extensive in the sense that the army of people who consciously apply science to practice is increasing steadily, and it grows deeper in the sense that this science which is applied in practice is developing steadily.

Communism will differ from socialism both in the character of the application of science to production as well as in the level of this science. Under Communism labor will become mass creative work--it will become an organic combination of the elements of mental and physical work.

It is in this direction that the character of the application of science to production will change during the building of Communism, a period into which the Soviet Union has already entered.

The perceptible proximity of Communism permits posing in a more concrete form, based on the realities of our situation, the problem of the organization of labor under Communism, of the changes in its character in connection with scientific and technological progress.

The process of permeating production with science has proceeded so far that scientific work in many cases should be considered productive work. There is no doubt at all that the merging of production and science will proceed henceforth at an increasing tempo. This means, however, that the peculiarities of the organization of production in a Communist society cannot help but affect one another. First of all, the matter to be discussed is the division of labor. Will it disappear?

The modern development of science and technology is characterized by an ever accelerating process of differentiation which results first of all in a more and more narrow specialization of the people working in the scientific and technological fields. The following example can give us some idea of the degree of the narrowing of specialization in technology: at the end of the nineteenth century engineers were trained in the two specialties of mining and metallurgical engineering--now the regular institutes of higher learning train engineers in about 40 specialties for these branches of industry.

Some of the comrades believe that the process of differentiation is characteristic of the science of the last 2 or 3 centuries, referring at this time to the fact that people of universal knowledge existed during the Renaissance. The conclusion of the finite nature of the process of differentiation in the future is based on this fact, that a process of coalescence, of unification, an integration process, is taking place in modern science along with differentiation.

Let us try to analyze these assertations. The first of these statements is based on a misunderstanding: it is sufficient to bear in mind here that the science of the ancients had no isolated branches. The philosophical systems of the ancient Greeks initially included all scientific knowledge of their times. However, these ancient Greeks had already actually separated astronomy, mathematics, and mechanics into independent sciences. From this time on, the process of the spearation and isolation of the sciences proceeded without interruption. Since the time of Aristotle history has not known a single person who could embrace creatively the entire system of scientific knowledge of his time. Even Leonardo da Vinci and the encyclopedist M. V. Lomonosov were not exceptions.

As for the second assertion, it is really necessary to recognize that integration of its isolated branches is taking place along with the differentiation of science? How is it expressed? First of all, in the penetration of the conclusions and methods of some sciences into others, and in the rise of rapidly developing boundary fields of knowledge at the junctions of two or several sciences (biochemistry, biophysics, geochemistry, et cetera). Each of the individual branches of science studies some of the aspects of phenomena and abstracts from the other aspects. It is impossible to acquire knowledge of the world which surrounds us without doing this. With the development of knowledge,however, the time comes when further progress in the knowledge of reality becomes impossible without taking into account the interrelationships between different aspects of phenomena, that is, without mutual penetration of two or several sciences. Narrow specialization of scientists becomes a hinderance on the path of progress.

When the penetration of capitalist methods into agriculture in the first half of the nineteenth century raised the question of its intensification, this gave rise to the need for serious study of the causes for soil fertility. Several isolated sciences (chemistry, biology, to some extent mineralogy, geology, and geography) attempted to solve this problem, but not one of them could do it. A half century was required before the Russian scientist V. V. Dokuchayev formulated the problem of a comprehensive approach to study of the soil. It can be considered that the true study of the soil began at this time. In our times, however, such studies are not the province of the chemists, biologists, mineralogists, but of soil scientists, since soil science, which has included elements of these sciences, has become an independent, isolated science. The process of integration led to new differentiation. The same thing has taken place in all other boundary regions of knowledge.

Integration is also expressed in the organization of scientific research work in which complex studies of any problem are conducted by teams of specialists from different fields. Even though each specialist deals with only one part of the problem, the whole team solves it in a complex manner through constant mutual consultations, corrections in the direction of investigations, et cetera. Such important scientific and technological problems as the development of a large electric power station artificial earth satellites, and others were solved in a complex manner in our country.

In this way the integration of sciences not only opposes the process of differentiation, but constitutes a basis for developing new branches of knowledge.

Will the process of the differentiation of science which is eexpressed in the specialization of people stop some time or other? It can be stated that there are no grounds at all for saying this. The fact of the matter is that this process is an expression of the contradiction between the unlimited possibilities of knowledge and the limits of the thinking of each individual, the contradiction between the widening and deepening of scientific knowledge and the limited nature of the possibilities of any given individual.

With the development of science and the growth of knowledge, man finds himself in the position of being able to embrace an ever smaller part of the general fund of science. Irene and Frederic Joliot-Curie stated this very precisely. In 1956 they wrote: "The progress of science has brought about a revolution in science itself. Our generation can no longer adapt itself to the new rhythm, which has become unavoidable for us. It is becoming more and more difficult to keep up with everything that is new, and often this turns out to be beyond our capacities. When we become acquainted with the names of scientists who have achieved significant results in order to obtain something of use for ourselves, we are often lost in the number of names even in one field. We oscillate between too narrow a specialization, which threatens to blunt out intellects, and the dispersal of our resources, which leads to their ineffective use. We endeavor to attend lectures, colloquims, and scientific conferences, then we do not have time for thinking of our own sci scientific research activities."

Both secondary and higher education is impossible without remembering factual material. It is natural that a certain part of this material disappears from the memory after we leave school. The amount of memorized factual knowledge can be decreased considerably without any deterioration of the training of specialists. Shortcomings in such knowledge can be offset readily by a well-organized reference service, in the first instance by publication of an adequate quantity of handbooks. In the more remote future, the achievements of cybernetics, in particular the improvement of memory devices, will also radically reorganize reference and information services. The lightening of the study load thus achieved will permit first expanding the circle of sciences with whose methods and fundamental conclusions the students

will become familiar, and then emphasizing training of the brain in education in such a manner that it will be easier for a person to orient himself in fields of knowledge unfamiliar to him, in case of need.

Expanding the circle of information communicated to the students can also be done through revising the courses, particularly in special educational establishments in the direction of their "consolidaton." As an illustration of this thought, one can point out that similar technological processes which take place in different branches of production are now examined separately in different courses as a rule. Let us assume that when the future coal-mining engineer learns about drilling in coal mining, he does not learn about the same process in the oil or hard-rock mining industries, and vice-versa. But such information can be unified by explaining it from the standpoint of a unified theory of drilling. This is all the more true, because the combination of education with productive labor as a result of the reorganization of education now being put into effect guarantees a better knowledge of the practical side of production. However, a prolonged and serious elaboration of the classification of the branches of science and technology is essential for such reform. In our opinion, the necessity for such an elaboration is now apparent and it will become more and more urgent.

The above measures will counter the process of differentiation in science and technology to a considerable extent, but cannot neutralize it.

This means that with the growing role of science in production, the specialization of people, and, consequently, their division of labor in society will be maintained in any case for a foreseeable period of time.

It must be emphasized that when the founders of Marxism spoke of the elimination of the division of labor in the future, they had in mind chiefly the liquidation of the old division of labor. In 1845-1846 K. Marx and F. Engels pointed out in the work Nemetskaya ideologiya [The German Ideology] that the degree of division of labor is the most vivid index of the level of development of the productive forces of a nation, but with the appearance of the division of labor "each acquires his definite, exclusive sphere of activities which bind him and from which he cannot escape..." (Collected Works, second edition, Vol. 3, pages 31-32). This restriction to a narrow sphere of social activity is one of the main factors in the preceding historic development, but it will not be so in the Communist society, since this society will create the possibility of many-sided activities for every individual.

It is characteristic that when the founders of Marxism developed the idea of the liquidation of the division of labor in more detail, they did not speak simply of the division of labor, but of the system which had been developed. Thus, in the draft of the program of the Union of Communists, the Printsipy kommunizma [The Principles of Communism], Engles wrote in 1847: "...the division of labor in its present form will disappear completely..." (op. cit., Vol. 4, page 335).

In Das Kapital K. Marx bases his conclusion of the replacement of the "private" worker by a comprehensively developed individual under Communism on an objective analysis of the causes and the consequences of the division of labor under capitalism. In speaking of the appearance of a manufactured division of labor, Marx points out that it arose to a large extent from the social division of labor (characterized by "the most varied social and economic forms"), but this latter division had arisen, developed, and would be broken up (Vol. 1, 1952, pages 366-367).

The evil of the manufactured division of labor consists in the fact that it "made the worker into a monstrosity by artificially infusing in him a one-sided skill and suppressing his productive inclinations and gifts... Not only were separate private jobs divided among different individuals but the individual himself was divided and transformed into an automatic tool of a given private job..." (op. cit., page 368). Marx in particular emphasized that the manufactured division of labor intensified the process of separating the worker from the spiritual potentialities of production which opposed him as an enslaving force (op. cit., page 369).

The appearance of machine production meant the elimination of that technical base on which the system of a manufactured division of labor existed but, nevertheless, it continued to survive, first, due to the strength of habit, subsequently being systematically restored as a means for exploiting the labor force. Marx wrote: "The lifelong specialty of controlling private tools was converted into a lifelong specialty of serving a private machine" (op. cit., page 427). In large capitalist industry the process of isolating the spiritual potentials of production from the worker was completed by separating science from productive work and subordinating it to capital.

In analyzing the contradictions which are inherent in large capitalist industry, Marx pointed out that on the one hand it continually made revolutionary changes in the technological basis and the functions of work, causing sharp changes in labor, "the all-around mobility of the worker" (op. cit., page 492); and on the other hand it "restored the old division of labor with its numbing specialties" (op. cit.). Marx wrote further that "the largest industry with its catastrophes makes the recognition of changes in labor a question of life and death, thus a greater versatility of workers is possible by the general law of social production, to whose normal implementation production relationships should be adapted" (op. cit., page 493).

Finally, K. Marx in his Kritike Gotskoy programmy [Critique of the Gotha Program] (1875) and F. Engels in his Anti-Dyuring [Anti-Duering] (1877) wrote of the disappearance under Communism of the division of labor which enslaved man, of the disappearance of the old division of labor and its replacement by an organization of production in which labor would be transformed from a means of enslavement into a means of the free development of man, from a heavy obligation to a satisfaction.

It is obvious that the founders of Marxism saw as the fundamental vice of the capitalist system of the division of labor its social consequences which limited the social functions of each individual to the narrow circle of his occupational activities. It was the liquidation of these social consequences that they had in mind when they spoke of destroying the old system of the division of labor.

The fundamental social evil of the capitalist system of the division of labor has been eradicated in our country in the course of building socialism. Liquidation of the exploitation of man by man has led to overcoming the antagonism between people who do mental and physical work, to the active participation of the working people in the administration of the state and the economy, and to their steady spiritual growth. Even after destroying the social basis of the old division of labor, however, socialism still cannot spare society from a material distinction between mental and physical work. This will require first of all a cultural and technical growth of the working people based on technological progress which will make possible the conscious application of scientific knowledge by every worker.. This problem too will be solved in the course of building a Communist society.

Thus the destruction of the social inequality between persons who do mental and physical work and of the material distinction between these forms of work on the basis of the extensive development of automation does not mean the liquidation of every sort of division of labor under Communism. It is necessary to bear in mind that when eliminating many present occupations, complex automation will give rise to new occupations which will be distinguished by greater versatility and which will require a higher level of knowledge from people.

The division of labor in the Communist society will be preserved but will have a purely production character and will not have social consequences. In the first place, the selection of specialties will be free; in the second place, differences in one's position in production will not cause inequality in respect to possessions or any other inequality.

At the same time, it is necessary to emphasize that every member of society will consciously subordinate himself to strict labor discipline, as the successful work of an enterprise, a planning and design bureau, or a scientific research group in unthinkable without unified leadership even in our times. The Communist society will be faced with far more complex problems of science and production whose solution is unimaginable without the efforts of large numbers of people united under a single will. The anarchistic concept of Communism is foreign to Marxism-Leninism. As N. S. Khrushchev pointed out in his report at the Twenty-First Congress of the Communist Party of the Soviet Union: "...this will be a highly-organized and orderly collaboration of working people. In order to control the machines, everybody will fulfill his occupational functions and social obligations at a specified time and in an established manner."

But is it possible then to speak of a many-sided development of one's personality? It certainly is possible.

The basic prerequisite of the many-sided development of one's personality consists in a sharp decrease in the time spent in work in the sphere of the production of material goods. It is necessary to add here that progress in the means of transportation and communications, the intelligent organization of the satisfaction of communal every-day necessities, and the acceptance by society of the basic responsibility for the upbringing of children will also give people considerably more free time.

The time free from work will be spent in fulfilling social functions, in self-improvement, in art, sports, et cetera. In addition, one must not forget that the very changes in the character of work which transform it into creative work, due to a combination of elements of mental and physical work, will provide unlimited possibilities for the development of personality.

Usually, when we discuss the elimination of the boundaries between mental and physical work, we are asked whether physical work will disappear some day. No, it will not disappear, for there is no objective necessity for this. We believe that heavy, exhausting toil will disappear, but that moderate physical work will always be necessary for the organism and that it will always bring joy to man. Moreover, at any stage in the development of the productive forces there will be work which it would be unprofitable to mechanize--such work, if mechanized would require more labor than if done by hand. However, physical labor will be closely interwoven with mental work and will disappear in the sense of being opposed to mental work.

The foregoing has been essentially an answer to the question of whether the time will come when man will be removed from the sphere of material production. Some claim that the introduction of machines that control technological processes means it will be possible to free man from material production. However, this is not so. It is sufficient to remember that the introduction of controlling machines, their constant improvement, and the designing of new machines will require deeper penetration into the patterns of production processes, all of which are unthinkable without the most active and creative participation of the people in material production. It is clear, therefore, that the introduction of new technology and the development of automation is incompatible with the elimination of man from production.

Being called upon to satisfy the requirements of society as fully as possible, production under Communism will endeavor to fulfill each of its tasks with the minimum outlay of labor. The society of the future will achieve a very high productivity of socialized labor. But is is for this very reason that it will make outlays of labor in a very careful and rational manner.

A combination of highly developed technology and a zealous attitude toward labor will permit society to solve the problems of remaking the face of our planet--changing the climate of huge regions by making changes in the direction of seas and atmospheric currents, the courses of rivers, changes in orography, et cetera. This whole process of changes in nature and perfecting social relations will be at the same time a process of the radical alteration of man himself and his spiritual qualities.

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